

## MgO-Based Tunnel Spin Injectors

### Abstract

A MgO tunnel barrier is sandwiched between semiconductor material on one side  
5 and a ferri- and/or ferromagnetic material on the other side to form a spintronic element.  
The semiconductor material may include GaAs, for example. The spintronic element  
may be used as a spin injection device by injecting charge carriers from the magnetic  
material into the MgO tunnel barrier and then into the semiconductor. Similarly, the  
spintronic element may be used as a detector or analyzer of spin polarized charge carriers  
10 by flowing charge carriers from the surface of the semiconducting layer through the MgO  
tunnel barrier and into the (ferri- or ferro-) magnetic material, which then acts as a  
detector. The MgO tunnel barrier is preferably formed by forming a Mg layer on an  
underlayer (e.g., a ferromagnetic layer), and then directing additional Mg, in the presence  
of oxygen, towards the underlayer.

15

dej: ARC920030071US1.app.doc